WHAT IS CLAIMED IS:

1. A method for improving the oxygen burning efficiency during the combustion of coke in a process for removing coke from catalyst particles in a regeneration zone, said method comprising:

(a) providing catalyst particles containing coke deposits in said regeneration zone;

(b) forming an elongated bed of said particles having at least one elongated side;

(c) heating up said bed by passing an inert gas stream over the particles at an initial inlet temperature of about 200°C to about 600°C;

(d) measuring a lag time during step (c) for a temperature wave to travel through said bed;

(e) passing an oxygen-containing recycle gas stream through said bed to combust coke and produce a flue gas;

(f) maintaining the initial inlet temperature until coke combustion approaches completion as determined by measurement of the bulk temperature of the flue gas leaving the bed or by measurement of a change in oxygen concentration of the flue gas; and

(g) ramping the inlet temperature to a final inlet temperature greater than the initial inlet temperature by using the lag time determined in step (d) to determine when to start said ramping in combination with a measurement of step (f); and

(h) completing coke combustion when the bulk temperature of the flue gas is substantially equal to the final inlet temperature.

2. The method of claim 1 wherein the elongated side has openings for transverse gas flow through the catalyst bed.

3. The method of claim 1 wherein the elongated bed has two ends, which are generally perpendicular to the elongated side and which are open for axial gas flow through the catalyst bed.

4. The method of claim 1 further comprising the step of recalculating the lag time by measuring the results obtained in steps (g) and (h), and iteratively applying the recalculated lag time for future ramping steps.

5. The method of claim 1 wherein the initial inlet temperature ranges from about 370° to about 550°C and the final inlet temperature is no more than about 600°C.

6. The method of claim 1 wherein the oxygen containing recycle gas comprises a substantially constant amount of oxygen from about 0.2 to about 3 vol-% concentration.

7. The method of claim 1 wherein the inlet temperature of step (f) is maintained until the flue gas temperature is observed to drop by about 3°C.

8. The method of claim 1 wherein the inlet temperature of step (g) is ramped in a substantially linear manner.

9. The method of claim 1 wherein step (a) further comprises withdrawing regenerated particles from said regeneration zone in a batch or at least semi-continuous flow.

10. The method of claim 1 wherein substantially equal temperatures of step (h) are substantially equal within a range of about 10°C.

11. An apparatus system for effecting the fixed bed regeneration of catalyst particles used in the conversion of hydrocarbons, which comprises in combination:

(a) a reaction zone comprising at least one vessel for contacting a fresh catalyst with a hydrocarbon stream and a recycle hydrogen gas stream to form a coked catalyst;

(b) a plurality of individual means to the reactor zone for adding and withdrawing catalyst, hydrocarbons, and recycle hydrogen gas respectively to and from the reactor zone;

(c) a regeneration zone comprising at least one vessel for combusting the coked catalyst with a recycle oxygen gas stream to form the fresh catalyst;

(d) a plurality of individual means to the regeneration zone for adding and withdrawing catalyst and recycle oxygen gas respectively to and from the regeneration zone;

(e) a heating means for raising the temperature of the recycle oxygen gas at an inlet to the regeneration zone sufficiently to begin combusting coke from the catalyst;

(f) a device for measuring a lag time for an outlet temperature to respond to and ultimately reach about the same value as an inlet temperature to the regeneration zone; and

(g) a controller device for ramping the inlet temperature with the heating means of step (e) using the measured lag time of step (f) in conjunction with a measurement of a change in the outlet temperature to complete combusting coke from the catalyst, said controller device optionally capable of detecting an outlet oxygen concentration.

12. The apparatus system of claim 11 wherein the catalyst from step (g) is withdrawn through a conduit means from the regeneration zone and added to the reactor zone in a batch or at least semi continuous flow.

13. The apparatus system of claim 11 wherein the heating means of step (e) raises the inlet temperature to a range of about 370° to about 550°C.

14. The apparatus system of claim 11 wherein the device of step (f) measures the lag time during an initial heating period prior to beginning combustion of coke.

15. The apparatus system of claim 11 wherein the controller device of both steps (f) and (g) form an integrated controller device.

16. The apparatus system of claim 15 wherein the controller device of step (g) uses a temperature change of greater than 3°C as the change in outlet temperature.

17. The apparatus system of claim 11 wherein the controller device of step (g) substantially linearly ramps temperature.

18. The apparatus system of claim 17 further characterized in that the controller device of step (g) linearly ramps temperature to a maximum of about 600°C.

19. The apparatus system of claim 11 further characterized in that the reaction zone of step (a) is a catalytic reforming reaction zone.

20. The apparatus system of claim 11 wherein at least part of the means of step (d) permits gas to flow axially through the catalyst.

21. A process for removing coke from catalyst particles in a regeneration zone comprising providing catalyst particles containing coke deposits in the regeneration zone to form a bed, passing a recycle gas stream comprising about 0.2 to about 3 vol-% oxygen through the bed to combust coke at an initial inlet temperature of about 370° to about 550°C, and using a measured lag time for a temperature wave to traverse the bed in combination with an outlet temperature drop of about 3°C or greater to trigger a substantially linear temperature ramping step up to a final inlet temperature of no more than about 600°C until coke combustion is completed.

22. The process of claim 21 wherein the linear temperature ramping step is performed under conditions of substantially constant oxygen concentration in the recycle gas stream.

23. The process of claim 21 further consisting of halogenation and reduction treatment steps after coke combustion is completed.

24. The process of claim 23 wherein the catalyst after reduction treatment is contacted with a hydrocarbon in a reactor zone.

25. The process of claim 21 wherein the catalyst particles are reforming catalyst particles.